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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/738,165	12/15/2000	Tamiya Onodera	JA919990276	2290

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HESLIN ROTHENBERG FARLEY & MESITI P.C.  
5 COLUMBIA CIRCLE  
ALBANY, NY 12203

EXAMINER
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ALI, SYED J

ART UNIT	PAPER NUMBER
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2195

DATE MAILED: 07/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/738,165

Applicant(s)

ONODERA, TAMIYA

Examiner

Syed J. Ali

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 April 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-8, 11-13 and 16-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 11-13 and 16-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. This office action is in response to the amendment filed April 27, 2005. Claims 1-8, 11-13, and 16-18 are presented for examination.
2. The text of those sections of Title 35, U.S. code not included in this office action can be found in a prior office action.

### ***Claim Rejections - 35 USC § 101***

3. **Claims 5-8 and 16-18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.**
4. As per claims 5 and 16, the apparatus is software per se, failing to be tangibly embodied or include any recited hardware as part of the apparatus. Though the apparatus is limited to one that is “computer-implemented”, there is no limitation that requires the apparatus include any hardware or tangible medium. A “computer-implemented apparatus” does not necessarily include anything more than a software module.
5. As per claims 6-8 and 17-18, they are dependent from non-statutory claims 5 and 16, respectively, and are thus non-statutory for at least the same reasons as discussed for their parent claims, as they also fail to recite any limitations that resolve the deficiencies noted above in the claims from which they depend.

*Claim Rejections - 35 USC § 103*

6. **Claims 1-8, 11-13, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agesen et al. (USPN 6,173,442) (hereinafter Agesen).**

7: As per claims 1-4, Agesen teaches the invention as claimed, including in a shared memory model system, a method whereby, in a state wherein a plurality of threads exist, a bit that represents a lock type and an identifier for a thread that has acquired a lock in accordance with a first lock type, or an identifier of a second lock type, are stored in a storage area that corresponds to an object and a lock on an object is thus managed, said method comprising:

determining, if a second thread attempts to acquire a lock on a specific object that a first thread has accessed, whether a bit that represents said lock type on said specific object represents said first lock type (col. 15 lines 30-34; col. 15 lines 45-49; col. 15 lines 53-64);

setting a contention bit if said bit represents said first lock type (col. 16 lines 40-44; col. 16 lines 66 - col. 17 line 4);

shifting said first thread, when said contention bit has been set, to an exclusive control state for a mechanism that enables the exclusive control of the accessing of said object (col. 11 lines 55-59; col. 15 lines 53-64), and a thread waiting operation and the transmission to a waiting thread of a notification (col. 12 lines 51-56), both of which are to be performed when a predetermined condition has been established (col. 14 lines 29-49);

permitting said first thread to transmit said notification to said waiting thread (col. 14 lines 29-49);

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setting said second thread in the busy waiting state, when said predetermined condition has not been established and when said special identifier has been stored, until a thread that holds said lock on said specific object is no longer present and until said bit that represents said lock type represents said first lock type (col. 11 lines 55-59; col. 12 lines 51-56);

permitting said first thread to exit said exclusive control state (col. 14 lines 42-49);

determining, before said first thread unlocks said specific object, whether said bit that represents said lock type represents said first lock type (col. 15 lines 30-34; col. 15 lines 45-49; col. 15 lines 53-64);

responsive to the determining, storing in said storage area a special identifier that differs from the identifiers for said plurality of threads (Abstract; col. 16 line 66 - col. 17 line 4), the special identifier indicating that a two-stage unlocking is to be performed, wherein only one synchronization command is needed for unlocking when no contention exists (Abstract; col. 6 lines 26-36);

issuing a synchronization command for said memory system (col. 17 lines 49-59);

storing in said storage area data indicating absence of a thread that holds said lock on said specific object (col. 18 lines 40-43);

determining whether said contention bit has been set if said bit that represents said lock type represents said first lock type (col. 17 lines 49-59);

terminating an unlocking process if said contention bit has not been set without any other process being performed (col. 17 lines 49-59);

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wherein said first lock type is a lock method whereby to manage a lock state an identifier for a thread that has locked an object is stored in correlation with said object (col. 15 lines 53-66); and

wherein said second lock type is a lock method whereby a queue is employed to manage a thread that has locked an access to an object (col. 12 lines 51-62).

8. It is noted that there is a slight difference between Agesen and the claimed invention in the determination of the lock type. While the claimed invention determines the lock type by checking a bit, Agesen calls a method (“getMetaLock”) that returns a bit field that indicates whether there is contention. When there is contention, the lock operates by storing the locking thread’s identifier in the lock object, corresponding to the claimed “first lock type”. On the other hand, if there is no contention, a linked list is utilized to control access to the lock, corresponding to the claimed “second lock type”. This discussion of the differences between Agesen and the claimed invention is incorporated by reference into the rejection of the other independent claims 5, 11, and 16.

9. As per claims 5-8, Agesen teaches the invention as claimed, including an apparatus comprising means for implementing the method of claims 1-4, respectively (Fig. 1).

10. As per claims 11-13, Agesen teaches the invention as claimed, including in a shared memory model system, a method whereby, in a state wherein a plurality of threads exist, a bit that represents a lock is stored in a storage area that corresponds to an object, and a queue of threads that access said object is stored to manage a lock on an object, said method comprising:

determining, when a second thread attempts to acquire a lock on a specific object that a first thread has accessed, whether a bit that represents said lock on said object represents the locked state (col. 11 lines 28-31; col. 11 lines 41-42);

increasing, when said bit that represents said locked state is set, the number of queues of threads that can access said specific object and storing the updated number, and determining whether said bit that represents said lock on said specific object represents said locked state (col. 11 lines 35-41; col. 11 lines 62-65);

reducing, when said bit that represents said locked state is not set, the number of said queues of said threads that access said specific object and storing the updated number, and terminating a locking process without any other process being performed (col. 14 line 53 - col. 15 line 3);

changing, when said bit represents said locked state, data for the number of threads in said queue that are waiting for access to said specific object and storing the updated data, and thereafter issuing a synchronization command for said storage area (col. 11 lines 35-41; col. 11 lines 62-65);

storing said second thread in a queue, and shifting said second thread to a control state for a mechanism that performs a waiting operation, for accessing said specific object, and a recovery operation by transmitting a notification (col. 12 lines 51-60);

storing in said storage area, before said first thread unlocks said object, said bit that represents said locked state and an identifier that is not related to the representation of said locked state or unlocked state (col. 14 lines 53-57), the identifier indicating that a two-stage unlocking is to be performed, wherein only one synchronization command is needed for unlocking when no contention exists (Abstract; col. 6 lines 26-36);

permitting said second thread, when said bit that represents said locked state is set and when an identifier that is not related to the representation of said locked state or said unlocked state is stored in said storage area, to remain in a busy waiting state until a thread that maintains said lock on said object is no longer present and said bit that represents said locked state is changed to represent said unlocked state (col. 12 lines 51-60; col. 14 line 29 - col. 15 line 3);

issuing a synchronization command for said storage area (col. 17 lines 49-59);

storing, in said storage area, data that does not represent said lock on said specific object (col. 16 line 66 - col. 17 line 4);

determining whether a thread that is stored in a queue is present (col. 14 lines 53-57);

shifting, when a thread that is stored in a queue is present, said first thread to a notification state wherein said transmission is initiated for issuing a notification to said thread that is waiting (col. 12 lines 51-60; col. 14 lines 29-49); and

permitting said first thread to exit said notification state (col. 14 lines 29-49).

11. As per claims 16-18, Agesen teaches the invention as claimed, including an apparatus comprising means for implementing the method of claims 11-13, respectively (Fig. 1).



*Response to Arguments*

12. **Applicant's arguments filed April 27, 2005 have been fully considered but they are not persuasive.**

13. Applicant argues that Agesen fails to teach the claimed feature where *"one identifier is provided for a thread that has acquired a lock in accordance with a first lock type, and a different identifier is provided for thread that has acquired a lock in accordance with a second lock type."*

14. It is Examiner's understanding that the "first lock type" is where synchronization is managed on an object by way of a data structure that holds a thread identifier to indicate which thread has obtained a lock on an object (Applicant's claim 3), while the "second lock type" manages synchronization by way of a queue. There is no mention in the claims of a "different identifier" for a thread that has acquired a lock in accordance with the second type. In fact, the only claim language in the independent claims relating to the second lock type indicates "an identifier of a second lock type" is "stored in a storage area." This limitation could be construed in several ways, e.g. the identifier merely indicates that the object is to be locked by a different method. There is no requirement of a different thread identifier based on the lock type.

Accordingly, whether the lock type is of the first or second type, a thread identifier is to be stored in a storage area corresponding to the synchronization object. As is well known in the art, this type of storage area is often referred to as a "monitor". Agesen discusses at length how such monitors are used in synchronization, specifically identifying a prior art method of synchronization when no contention exists. In such a method, the object monitor includes "a

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thread identifier, a lock count, and a 'monitor shape bit.'" (col. 5 line 64 - col. 6 line 18). This "type" of lock corresponds to the claimed "first lock type", where an identifier that has locked an object is stored in correlation with the object. Though the prior art method does not support contention, Agesen identifies this problem and provides a solution that does support contention.

15. Applicant argues that Agesen does not address the use of a contention bit or the setting of the contention bit if the bit represents the first lock type.

16. Examiner has already addressed the discrepancies between the claimed setting of a contention bit and the method of setting contention bits used by Agesen above in paragraph 8. However, to reiterate, Agesen uses a method call to indicate that there is contention for an object. Each synchronization object has a "synchronization-state field" that indicates whether the object is locked and/or if there are threads waiting to lock the object. The field is a two-bit field, where the most significant bit indicates whether there are waiting threads and the second bit indicates whether the object is locked. When a thread seeks to lock an object, the getMetaLock( ) routine is called, which sets the value of the synchronization-state field to "11", indicating that there are threads waiting to lock the object and the object is or will be locked. The first bit, which reflects that threads are waiting for the object, can be thought of as the "contention bit."

17. Applicant argues that Agesen fails to teach "*a special identifier indicative of a two-stage unlocking process...wherein only one synchronization command is needed for unlocking when no contention exists.*"

18. Agesen discusses the prior art approach of handling synchronization when no contention exists. In such a case, a single atomic "compare-and-swap" operation is performed, i.e. one synchronization command is needed for unlocking the resource (col. 6 lines19-36).

### *Conclusion*

19. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Syed J Ali whose telephone number is (571) 272-3769. The examiner can normally be reached on Mon-Fri 8-5:30, 2nd Friday off.

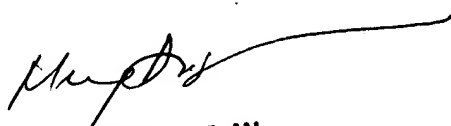
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai T An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Syed Ali  
June 28, 2005



MENG-AL T. AN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER